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MERCHANT & GOULD P.C.
P.O. Box 2903, Minneapolis, MN 55402-0903
(612) 332-5300



PERSONAL LISTENING DEVICE FOR ARENA EVENTS

Technical Field

The invention disclosed herein relates to sound distribution systems, and more particularly to a system and method for real-time distribution of sounds emanating from an event to those in attendance at the event.

Background of the Invention

Sporting events have become a part of the American culture, oftentimes serving as a focal point around which friends and families gather. Fans hungrily devour sports information and discuss the latest game. To serve this ravenous interest, various enterprises have sprung up, including sports-oriented networks, websites and magazines. The goal of each of these services is to give each fan what he or she most desires: to be closer to the game.

Nowhere can a fan be closer to a game than by actually attending the game in a front-row seat. With a front-row seat, every nuance of the game can be seen and heard. Coaches and players can be overheard. Players can be heard shouting encouragements and discussing strategy. A front-row seat permits a fan to experience the game in a personal and dramatic way. Front-row seats are exciting. Unfortunately, front-row seats are not available to everyone.

Fans who attend sporting events, but are not lucky enough to possess front-row tickets find their experiences to be more remote. Small gestures by the players and coaches cannot be seen from a distance. The various sounds of the game go unheard. The shouts of players become inaudible. It is impossible to hear coaches and players discussing the game. Even the sound of a bone-crunching tackle cannot be heard. Quite simply, the game loses some of its drama.

To counteract the negative effects of distance, fans have employed many strategies. Many fans bring binoculars to aid them in seeing the visual nuances lost with distance. Other fans bring radios to permit them to hear a broadcast of the game. Radio broadcasts are not effective surrogates for a front-row seat, however. Radio broadcasts do not carry sounds collected from the field of play, nor do such broadcasts carry sounds

collected from areas immediately surrounding the field of play (such as dugouts or team benches). Additionally, radio broadcasts are typically delayed so that they are not synchronized with the game as it actually occurs. An additional drawback of radio broadcasts is that they carry a narrative of the game, an often unwanted feature for a fan that is already able to discern the major developments of the game.

Some fans bring hand-held televisions to sporting events. Hand-held televisions also have drawbacks, though. They are small and require the fan to remove his attention from the field of play, instead turning it to the television. Additionally, the broadcast is delayed. Most importantly, when viewing a televised sporting event, the fan is receiving a produced version of the game, rather than a true-to-life front-row experience.

The inadequacies of radio and television broadcast are reflected in the attendance figures for professional sports. Many professional sports teams fail to sell-out a significant number of their games, leading to several undesirable results. Often, in response to low attendance figures, professional sports organizations are forced to lower ticket prices for seats that offer a less intimate game-time experience. Some leagues impose television blackouts with respect to games that fail to sell-out, thereby inducing further losses due to lost television revenue. Even if tickets are sold, non-attendance results in lost concession and souvenir sales. Low revenues—whether the low revenues stem from unsold tickets or from non-attendance—are also a major factor in the relocation of professional sports franchises. Relocation of professional sports franchises is troubling on two fronts. When a professional sports franchise relocates, the community that loses its franchise loses a source of community pride and entertainment. Additionally, professional sports leagues that permit its franchises to move often suffer from fan cynicism, with many fans choosing to turn away from the particular sport entirely, thus resulting in further lost revenue for the league as a whole.

To preserve fan interest in and attendance of sports events, there exists a need for a method or system for providing fans with an experience approximating the close, exciting, and personal feel of a front-row ticket.

Summary of the Invention

The method and apparatus in accordance with the present invention solves the

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aforementioned problem and other problems by transmitting sound generated at an event to those in attendance at the event. This is accomplished by a system that collects an acoustic audio signal generated at a first location within a fixed space. In some embodiments, the system also conditions the audio signal without introducing audio signals generated from outside said first location. Finally, in some embodiments, the system transmits the conditioned audio signal to a receiver worn by at least one of a plurality of individuals within the aforementioned fixed space. This invention is particularly useful in settings such as a football stadium, a basketball arena, a hockey arena, a baseball stadium, an auditorium, a performance area in a restaurant or cruise ship, a soccer arena, a boxing ring or wrestling ring, an automotive racing track, or any other space within which a performance takes place.

In another embodiment of the invention, the system collects an audio signal generated at a first location within a fixed space. The system then transmits, under a first transmission protocol uniquely associated with a particular event and first location within the fixed space, the audio signal collected from the first location to a receiver worn by at least one of a plurality of individuals within the fixed space. Finally, the audio signal is received by a receiver that is configured to operate under the aforementioned first transmission protocol.

In yet another embodiment of the invention, the system collects an audio signal generated at a first location within a fixed space at a particular event. Next, the system transmits, under a particular transmission protocol uniquely associated with the particular event, the audio signal to a receiver worn by at least one of a plurality of individuals within the aforementioned fixed space and at a distance from the aforementioned first location such that said individual would not otherwise hear the audio signal generated at the first location. Finally, a fee is charged to individuals in attendance at an event within the aforementioned fixed space in exchange for the aforementioned earpiece.

In yet another embodiment of the invention, the system collects an audio signal generated at a first location within a fixed space at a particular event. Next, the system transmits, under a particular transmission protocol uniquely associated with the particular event, the audio signal to a receiver worn by at least one of a plurality of individuals within the aforementioned fixed space. Finally, revenue is derived from the distribution

of the earpiece.

In yet another embodiment of the invention, a system for distribution of sound within a fixed space is comprised of one or more audio collection units for collecting one or more audio signals from one or more locations with a fixed space. Additionally, one or more signal conditioning units are coupled to the aforementioned one or more audio collection units for conditioning the aforementioned one or more audio signals without introducing an audio signal generated from outside the aforementioned one or more locations. Finally, one or more transmitters are configured and arranged to transmit the aforementioned one or more audio signals under one or more transmission protocols, such that each of the aforementioned one or more audio signals is transmitted under its own transmission protocol, with the transmission protocol under which each of the aforementioned one or more audio signals is transmitted being uniquely associated with a particular event.

Brief Description of the Drawings

FIG. 1 depicts a system and method for collecting sound generated at one location within a defined space and transmitting it to another location within that defined space.

FIG. 2 depicts a system and method for collecting sound generated at more than one location within a defined space and transmitting it to another location within that defined space.

FIG. 3 depicts a system and method for the use of particular transmission protocols on an event-by-event basis.

FIGS. 4A-4C depict various embodiments of transmitters in accordance with the present invention.

FIGS. 5A-5C depict various embodiments of receivers in accordance with the present invention.

FIG. 6 depicts a system and method for the use of multiple transmission protocols to enable a microphone-by-microphone selection.

FIG. 7 depicts one business method in accordance with the present invention.

Detailed Description of the Invention

Figure 1 illustrates the principle that sound that is generated at a point of interest within a fixed space can be collected and redistributed to members of an audience within that fixed space. Generally, the aforementioned fixed space is defined by the boundary of the audience in attendance at an event. For example, if the event in question is a football game, the point of interest at which sound is being collected might be the line of scrimmage, and the fixed space might be defined by the football stadium in which the audience is contained. Figure 1 diagrammatically represents a football arena as one example of an environment in which the system and method could operate. One skilled in the art would understand that the system described herein could operate in any fixed space. On the field **100** of play, sounds are generated by athletes engaged in the activity of playing football (for example, calling out audibles, engaging in banter, or making vicious tackles). Sounds are also generated up on areas immediately surrounding the field **100** such as players' benches and visiting and home sidelines. Fans are illustrated as sitting in stands **102**. Some fans are seated in regions too remote from the field **100** of play to be able to hear the noises generated thereon or thereabout. Accordingly, the system and method collects the sounds from immediately on the field or thereabout the field and redistributes that sound to the fans in the bleachers **102**. Some of the fans may be situated in such a fashion that they could not ordinarily hear some of the sounds being transmitted.

The system is generally comprised of an audio collection unit **104** (which receives an acoustic signal and transduces it into an electrical signal), a signal conditioning unit **106** (which receives the transduced electrical signal from one or more audio collection units **104** and filters, mixes and/or switches the signal(s) to produce an appropriate signal for transmission), and a transmitter **108** (which transmits the signal provided by the signal conditioning unit **106**). The audio collection unit **104** may be comprised of any form of microphone suitable for collecting noise from the field **100** of play and regions immediately thereabout. One example of such a microphone is a parabolic microphone, as is customarily used for collecting sound during sports broadcasts.

The signal conditioning unit **106** may include mixers for adjusting the level of multiple sources of audio signals, filters for filtering out frequency content not desirable

in an audio signal, and switches for selecting amongst audio sources. Signal conditioning unit **106** serves as an interface between audio collection unit **104** and transmitter **108** and is therefore coupled either directly or indirectly on its input side to audio collection unit **104** and either indirectly or directly on its output side to transmitter **108**.

5 Transmitter **108** receives the conditioned signal from signal conditioning unit **106**, amplifies the signal, modulates the signal, and transmits the signal throughout the fixed space (in this case a football arena). A representative fan **110** is shown sitting in bleachers **102** wearing a receiver **112**. Receiver **112** is configured and arranged to receive the signal transmitted by transmitter **108** and deliver an audio signal to fan **110**.

10 Fan **110** is thereby provided with an audio source simulating the effect of his having sat in a front-row seat or having been immediately on or about the field **100** of play.

Transmitter **108** is shown in greater detail in Figures **4A-4C**.

As stated earlier, Figure **1** depicts a football arena for illustrative purposes only. The system and method described in Figure **1** would be equally well suited to an enclosed
15 space defined by a basketball arena, a hockey arena, a baseball stadium, an auditorium, a performance area in a restaurant or cruise ship, a soccer arena, a boxing ring or wrestling ring, an automotive racing track, or any other space within which a performance takes place.

Figure **2** illustrates the principle that sound may be collected from many points on
20 or about the field. In Figure **2**, the audio collection unit is shown as being comprised of two parabolic microphones **200**, **202**. The field **100** of play is shown as being divided into two regions **204**, **206**. Region **204** is primarily recorded using parabolic microphone **200**. Similarly, region **206** is primarily recorded using parabolic microphone **202**.

Parabolic microphones **200**, **202** are connected on their output end either directly or
25 indirectly to signal conditioning unit **106** which receives the signals, potentially mixing, filtering and switching the signals, and then outputs a conditioned signal to transmitter **108**. The signal transmitted to fan **110** may thus be produced by switching and mixing between various microphones **200**, **202**.

For example, rather than moving the audio collection unit along the field as the
30 point of interest changed, as might happen when a football team moves up and down a field, multiple microphones **200**, **202** may be situated along the football field. As the ball

is moved up or down the football field, a producer may, using the signal conditioning unit **106**, raise the signal level of a microphone that collects sound from a region of the field upon which the ball is located. Microphones located near a region of the field more remote from the ball may be progressively mixed down or switched off altogether.

5 Additionally, a sideline conversation of particular interest may be mixed up, mixed down or turned off altogether. Thus, in keeping with the principle just discussed, it follows that although the field **100** is shown as being divided into two regions **204**, **206** recorded by two parabolic microphones **200**, **202**, the field **100** may actually be divided into as many regions as is necessary to conveniently record the game. It is understood that each region
10 will be recorded by its own microphone.

Although Figure **2** shows each microphone **200**, **202** as being physically connected via a cable to signal conditioning unit **106**, it is understood that this connection may be indirect and accomplished via transmission.

One anticipated method for the use of the system depicted in Figures **1** and **2**
15 involves the sale of receiver **112** to one or more fans **110** in attendance at a particular event within the stadium. Since this profit model is reliant upon fan **110** purchasing a receiver **112** for each event that fan **110** attends, it is important that a receiver **112** sold to a fan **110** for a particular event not be functional during a following event. Figure **3** illustrates a system and method designed with this constraint in mind.

20 As can be seen from Figure **3A**, during a first event, transmitter **108** transmits its collected signal via a first transmission protocol uniquely associated with the first event. The fan **110** in attendance at the first event is wearing a receiver designed to operate and receive transmissions made in accordance with the first transmission protocol. During a second event, depicted in Figure **3B**, however, transmitter **108** will be transmitting under
25 a second transmission protocol, so that if a fan **110** in attendance at the second event tries to use a receiver from the first event, that fan **110** will be unable to receive the transmission that is being broadcasted. The inoperability of the receiver purchased at the first event stems from the fact that that receiver was designed to receive transmissions made in accordance with the first transmission protocol, but the broadcast at the second
30 event is made in accordance with a second transmission protocol. Therefore if a fan **110** wishes to receive the service of having sounds collected on or about the playing field

transmitted to him, he must purchase a receiver at the second event, and may not receive the transmission using a receiver purchased at the first event.

Figures 4A-4C depict three transmitters 401, 411, 421 capable of transmission under varying transmission protocols. One skilled in the art would understand that the transmitters depicted in Figures 4A, 4B and 4C are exemplary only and that many other such transmitters could serve the purpose of transmitting using differing transmission protocols from event to event.

Turning to Figure 4A, therein is depicted a transmitter 401 which alters its transmission protocol by simply carrying its signal on a different carrier frequency from game to game. The transmitter 401 of Figure 4A is shown as receiving two audio sources 400. In principle, the transmitter 401 of Figure 4A could receive any number of audio sources, including only one audio source. The audio sources 400 are supplied to a mixer 402. The mixer 402 adjusts the relative signal strength of each audio source 400 received by it. The mixer 402 may also have switching ability, allowing the mixer 402 to completely turn off a particular audio source 400. Mixer 402 may also contain filters designed to eliminate signal components and frequency ranges that are undesired. Mixer 402 may also be embodied in an electrical component separate from transmitter 401. For example, one skilled in the art would understand that mixer 402 may be embodied within signal conditioning unit 106. Modulator 404 is coupled to the output of mixer 402 and receives the mixed signal, using that mixed signal to modulate a carrier signal. The frequency of the carrier signal to be modulated is a selectable value. The output of modulator 404 may be filtered to eliminate signal components in frequency ranges that are undesired. The output of modulator 404 is then fed to amplifier 406. Amplifier 406 is designed to receive a signal from modulator 404 and amplify it by a certain gain factor, such that when the output of amplifier 406 is fed to antenna 408, the resultant transmission will be strong enough to reach about the defined space such as a football arena, but not significantly further.

By selecting a different frequency to be employed by modulator 404 from event to event, a fan 110 can be discouraged from trying to bring a receiver 112 purchased at one event to a subsequent event. For example, consider a situation in which the transmitter of Figure 4A is used at a football arena that houses ten home games a year. If

at the first home game a first frequency is used as a carrier signal, a fan **110** wishing to receive the transmission would be required to have a receiver designed to receive a signal carried by at that frequency. If at the second home game the frequency used as a carrier signal by modulator **404** is selected to be a second frequency (different from the first frequency), then a receiver **112** purchased by a fan **110** at the first home game would not be useful to receive the signal transmitted at the second home game. Therefore, fan **110** would be obliged to purchase another receiver **112** at the second game if he wished to receive the transmitted sounds from the playing field. Thus, by changing the frequency at which the transmission will be carried from game to game or from event to event, a fan can be discouraged from only purchasing a single receiver, rather than purchasing a receiver at each event.

Figure **4B** depicts a transmitter **411** employing digital transmission and direct sequence spread spectrum technology. This type of transmitter may be useful for at least the following reason. It is possible that, if the transmitter **411** of Figure **4A** were employed using simple amplitude modulation or frequency modulation, a fan could receive the transmitted signal by bringing a scanner to the game, thereby receiving the broadcast service for free. To minimize that risk, the modulator **404** shown in Figure **4A** could use a modulation technique not ordinarily employed by scanners, such as phase modulation. However, even that would have certain drawbacks. The spectral space in which the transmitter of Figure **4A** is likely to be permitted to transmit in by the FCC is likely to be limited. Therefore, there will only be a limited number of carrier frequencies from which to choose. It follows, then, that at some point over a certain number of games, carrier frequencies may have to be reused, in which case a fan could use a receiver he had purchased from a previous game to receive the broadcast. However, the transmitter **411** depicted in Figure **4B** uses both carrier frequency and spreading code set as variables which can be altered to determine the transmission protocol. Therefore, a greater number of transmission protocols can be employed by using the transmitter depicted in Figure **4B**.

Like the transmitter **401** of Figure **4A**, the transmitter **411** of Figure **4B** is able to receive multiple audio signals **400**. Also like the transmitter of Figure **4A**, the transmitter of Figure **4B** employs a mixer **402** that is capable of adjusting the relative signal strength

of the multiple audio signals received by its input stage. Mixer **402** also may also employ switches enabling the mixer to completely turn off certain audio sources. The output of mixer **402** may contain a filter to eliminate signal content and frequency ranges that are undesired. Mixer **402** may also be embodied in an electrical component separate from transmitter **411**. Sampler **410** is connected to the output stage of mixer **402** for the purpose of periodically sampling and thereby digitizing the output of the mixer **402**.

Sampler **410** delivers its digitized signal to spreader **412**. Spreader **412** receives a signal that has been sampled at a certain number of samples per second and using a set of codes, breaks each sample into a larger string of ones and zeros known as "chips." Because the signal when expressed with chips contains more chips per second than bits per second, the Nyquist frequency of the chipped signal is greater than the Nyquist frequency of the sampled signal and therefore has a wider spectrum. As will be shown in Figure **5B**, a receiver employing direct sequence spread spectrum technology must employ the same codes as the transmitter in order to receive the signal. The signal from the spreader **412** is then fed to modulator **414**, which like the transmitter of Figure **4A**, uses a selectable frequency to set the frequency of the carrier signal that is being modulated against the output from the spreader **412**. The signal generated by modulator **414** is then fed to amplifier **416**, which amplifies the signal to a signal strength sufficient to broadcast the signal via antenna **418** throughout the enclosed space such as a football field without extending significantly further.

The transmission protocol employed by the transmitter **421** of Figure **4C** is defined by the frequency of the carrier signal selected by the modulator and the key used by an encrypter container within the transmitter. Like the transmitter of Figure **4B**, the transmitter **421** illustrated in Figure **4C** can receive multiple audio signals on its input.

Also like the transmitter of Figure **4B**, the transmitter **421** of Figure **4C** contains a mixer **402** at its front end. The mixer **402** has the ability to adjust the relative signal strength of its multiple audio inputs. Mixer **402** may also have switching ability so as to be able to turn on and off a particular audio source or sources. The output stage of mixer **402** may have a filter designed to attenuate signal components in frequency ranges that are undesired. Mixer **402** may also be embodied in an electrical component separate from transmitter **421**. The output stage of mixer **402** is fed to a sampler **410** that samples the

mixed signal at a particular rate, thereby producing a digitized signal. The digitized signal is then fed to an encrypter **420**. The operation of encrypter **420** is determined by the encryption key that it employs. The encryption key is programmable so that it may be changed from use to use and therefore from event to event. The output of encrypter **420** is an encrypted digital signal that is fed to modulator **422**, which modulates a carrier signal of a selectable frequency. The output of modulator **422** is delivered to amplifier **424**, which amplifies the signal to a certain signal strength sufficient to reach throughout the defined space, such as a football stadium, when transmitted by antenna **426**.

Like the transmitter of Figure **4B**, the transmitter **421** of Figure **4C** is able to employ relatively more transmission protocols in a finite spectral space because its transmission protocol is defined by frequency and one other variable, in this case an encryption key. As will be seen in the discussion related to the receiver revealed in Figure **5C**, a receiver intended to operate with this transmitter must use the same encryption key or a matched decryption key in order to properly receive the transmitted signal.

The transmitters **401**, **411**, **421** depicted in Figures **4A** - **4C** may be fixed or may be mobile and are presented as examples of transmitters that may be suitable for such an application. One skilled in the art would understand that many such transmitters would be suitable for this application.

Figures **5A-5C** depict receivers **501**, **511**, **521** suitable for embodying the method and apparatus depicted in Figures 1-3. Figure **5A** depicts a receiver **501** suitable for receiving a signal transmitted by the transmitter **401** of Figure **4A**. Figure **5B** depicts a receiver **511** suitable for receiving a signal transmitted by the transmitter **411** of Figure **4B**. Figure **5C** depicts a receiver **521** suitable for receiving a signal transmitted by the transmitter **421** of Figure **4C**.

The receiver **501** of Figure **5A** has an antenna of appropriate geometry to receive a signal transmitted at the particular carrier frequency used by the transmitter of Figure **4A**. The output of antenna **500** therefore contains the modulated carrier signal that was output from amplifier **406**. Demodulator **502** has its input stage coupled to antenna **500**, thereby receiving the aforementioned carrier signal. Demodulator **502** takes the modulated carrier signal and restores it to its baseband form. The output of

demodulator **502** may contain a filter or set of filters intended to remove signal components of undesired frequency ranges. The operation of demodulator **502** can be controlled by selecting the frequency it uses to demodulate the received signal, thereby allowing the receiver **501** to operate under a transmission protocol suitable for receiving the transmission of the transmitter depicted in Figure **4A**. At its input stage, amplifier **504** receives a signal emanating from the demodulator **502**. Amplifier **504** amplifies the signal to a suitable signal strength so that the user of this receiver is able to hear the signal coming out of speaker **506**.

The receiver **501** depicted in Figure **5A** may be disposable or may be recyclable. The receiver of Figure **5A** may also be optionally fashioned in the form of an earpiece or personal speaker of some form to permit only one user at a time to listen to the signal produced by speaker **506**. In fashioning the receiver **501** of Figure **5A** in this manner, each member of a party will be forced to purchase the receiver of Figure **5A** in order to enjoy its associated service.

The receiver **511** of Figure **5B** has an antenna **508** of suitable geometry to receive the signal transmitted by the transmitter of Figure **4B**. Therefore, the output of antenna **508** contains the modulated carrier signal delivered by amplifier **416**. Demodulator **510** is coupled at its input stage to the antenna **508**. Demodulator **510** takes the signal encoded on the carrier signal and restores it to its baseband form. The operation of demodulator **510** is determinable by selecting the frequency used to demodulate its input. The output of demodulator **510** may contain one or more filters designed to eliminate signal components having undesirable frequency ranges. The output of demodulator **510** is therefore a sequence of chips, otherwise known as a "spread spectrum signal," and is fed to correlator **512**. Correlator **512** correlates the spread spectrum signal provided by demodulator **510** against a set of spreading codes, thereby yielding the original unspread signal. The operation of correlator **512** is determined by the code set against which the correlation is performed, and may therefore be selectable by programming the code set. The output stage of correlator **512** may include digital-to-analog converter to restore the digital signal to an analog form, and may also include one or more filters to remove signal components having frequency ranges that are undesirable. Amplifier **514** receives the signal emanating from correlator **512**. Amplifier **514** amplifies the signal strength of

its input so that the user of the receiver depicted in Figure **5B** is able to hear the signal when it is played by speaker **516**.

The receiver **511** depicted in Figure **5B**, like the receiver **501** depicted in Figure **5A**, may be fashioned in the form of an earpiece or some form of personal listening device so as to permit use by only one fan or person at a time. Also like the receiver **501** of Figure **5A**, the receiver **511** of Figure **5B** may be disposable or may be recyclable.

The receiver **521** of Figure **5C** has an antenna **518**, the geometry of which is designed to permit the antenna **518** to receive the signal transmitted by the transmitter of Figure **4C**. Accordingly, the output of antenna **518** contains the modulated carrier signal delivered by amplifier **424**. Demodulator **520** receives at its input stage the signal from the antenna **518** and, like demodulators **502** and **510**, demodulator **520** has a selectable frequency to permit demodulation of signals centered about various carrier frequencies. Demodulator **520** may have a filter or set of filters on its output stage to attenuate signal components having undesirable frequency ranges. The output of demodulator **520** is fed to decrypter **522**. The operation of decrypter **522** is controlled by a selectable key. The key used in conjunction with decrypter **522** should be the same key used by encrypter **420**, or should be a matched key. The output stage of decrypter **522** may have a digital-to-analog converter to restore the decrypted digital signal to its original analog form. The output stage of decrypter **522** may also have one or more filters designed to eliminate signal components in unwanted frequency ranges. The input stage of amplifier **524** receives the signal delivered from decrypter **522**. Amplifier **524** operates to amplify its output to a signal strength, such that the user of the receiver depicted in Figure **5C** will be able to hear the audio signal when the output of amplifier **524** is played through speaker **526**.

The receiver **521** of Figure **5C**, like the receivers **501**, **511** of Figure **5B** and **5A**, may be fashioned as an earpiece or any form of personal listening device for the same reasons as stated above. The receiver **521** of Figure **5C** may also be either disposable or recyclable.

The receivers **501**, **511**, **521** depicted in Figures **5A-5C** may be fashioned to be operable for a set of events, such as an entire season of sports events. For example, rather

than being configured for usage during a single event (such as a football game), the receivers of Figures 5A-5C receiver may be configured to use a particular protocol for an entire season. Alternatively, the receivers 501, 511, 521 of Figures 5A-5C may be configured to permit use of a range of pre-scheduled protocols identified for use during a season of events (such as an NFL season). For example, if it were determined that a particular professional football team would use ten protocols during ten home games, the receivers 501, 511, 521 of Figures 5A-5C may be configured to selectably operate under those ten protocols. Thus, a fan would be enabled to purchase a single receiver and yet receive the service for an entire season.

Figure 6 illustrates the principle that the sound collected by various audio collection units can be transmitted simultaneously during the same event, yet transmitted under different transmission protocols, thus allowing a recipient of the service to choose among the various audio collection units for reception. As can be seen from Figure 6, audio collection unit 600 receives sound from one region of the playing field, while audio collection unit 606 receives sound from another region of the playing field. Although Figure 6 shows the various audio collection units collecting sound from various regions of the field, it is possible that audio collection units could be used to collect sound from, for example, a home sideline and a visiting sideline, an offensive huddle and a defensive huddle, or a home dugout and a visiting dugout.

As shown in Figure 6, each audio collection unit 600, 606 is connected to its own signal conditioning unit 602, 608 and transmission unit 604, 610. As can also be seen, each transmission unit 604, 610 operates under its own transmission protocol. A fan using the service wears receiver 612, and can choose to tune into one transmitter or the other. This fan's choice could be aided by the distribution of a menu that allows the fan to know which transmission protocol correlates with which audio collection unit. For example, upon entry of a stadium, a fan could be passed a menu revealing that transmission protocol #1 will allow him to listen to an offensive huddle, transmission protocol #2 to a defensive huddle, protocol # 3 to a visiting sideline, transmission protocol #4 to a home sideline, and transmission protocol #5 to the region of the field where the ball is, and so on.

Although Figure 6 shows each audio collection unit 600, 606 being connected to

its own signal conditioning unit **602, 608** and its own transmission unit **604, 610**, each audio collection unit **600, 606** could be connected to a single central signal conditioning unit which could be connected to a single transmission unit which would transmit each signal collected by each audio collection unit using different transmission protocols.

5 The system and method of Figure **6** could be implemented using the transmitter and receivers shown in Figures **4A-4C** and Figures **5A-5C** so that the transmission protocol could be defined based upon either purely frequency, or a combination of frequency and spreading code set or a combination of frequency and encryption key. A user of the service would then wear the receiver **612** and select either simply the
10 frequency that he wished to tune in or the frequency in combination with the spreading code set or the frequency in combination with the decryption key.

 The systems and methods shown in Figures **1-6** share some common properties. For example, the transmission shown by the method and system of Figures **1-6** is contemporaneous with the event from which the sound is being collected so that minimal
15 delay is introduced between the collection of the signal and the transmission of the signal. In other words, a fan receiving the transmission and watching the game would notice little delay between the events witnessed and the sound transmitted to him. Another property shared in common by the systems and methods in Figures **1-6** is the absence of two-way communication. In other words, the user of the service has no ability to
20 communicate with the transmission unit. Another characteristic shared in common by the systems and methods of Figures **1-6** is that the sound being transmitted is the result purely of the sound being collected from on or about the playing field or area of interest, and does not include a narrative of the event, as would be found in a conventional radio or television broadcast. Stated otherwise, the sound being transmitted is, in large part, the
25 sound being collected from the audio collection units, with few additions. It is contemplated, however, that advertizing could be transmitted between plays, for instance, or that other insignificant sound could be mixed with and transmitted with the sound collected from the field.

 Figure **7** illustrates one particular business method by which the systems and
30 methods described in Figures **1-6** could be employed. As can be seen in Figure **7**, at least two profit models could be employed. In operation **700**, a profit model is employed

whereby each fan purchases a receiver, if that fan desires to be a recipient of the broadcast service. In operation **702**, a profit model is shown wherein commercial time is sold to those who would wish to purchase advertising. Commercial transmission may take place at various intervals during an event such as between plays, during scheduled commercial breaks, between quarters and during halftime, between periods or innings, etc. Operations **700** and **702** could be employed conjunctively, meaning that one could both sell the receivers and sell commercial time. Operations **700** and **702** could also be employed disjunctively, meaning that one could either sell the receivers or sell commercial time, without doing both. Operation **704**, which follows either the conjunctive or disjunctive performance of operations **700** and **702**, requires that the audio signal of the particular event be collected and subsequently transmitted to receivers located within the space defined by the arena, stadium, theater, etc. in operation **706**. Operation **708**, which is performed at the termination of the service, shows that the receivers may either be disposed of or recycled. If a recycling model is used, fans could return the receivers in exchange for the return of a deposit and receivers could be reprogrammed at a later time with a different set of transmission protocols.

From the foregoing detailed description and examples, it will be evident that modifications and variations can be made in the devices and methods of the invention without departing from the spirit or scope of the invention. Therefore, it is intended that all modifications and verifications not departing from the spirit of the invention come within the scope of the claims and their equivalents.

THE CLAIMED INVENTION IS:

1. A method of delivering sound to a plurality of individuals, the method comprising the steps of:
collecting an acoustic audio signal generated at a first location within a fixed space;
conditioning said audio signal, without introducing audio signals generated from outside said first location; and
transmitting said conditioned audio signal to an earpiece worn by at least one of said plurality of individuals within said fixed space.
2. The method of claim 1 wherein the step of collecting an acoustic audio signal generated at a first location within a fixed space comprises collecting an acoustic audio signal generated upon or immediately about a football field within a football stadium.
3. The method of claim 1 wherein the step of collecting an acoustic audio signal generated at a first location within a fixed space comprises collecting an acoustic audio signal generated upon or immediately about a basketball court within a basketball arena.
4. The method of claim 1 wherein the step of collecting an acoustic audio signal generated at a first location within a fixed space comprises collecting an acoustic audio signal generated upon or immediately about a hockey rink within a hockey arena.
5. The method of claim 1 wherein the step of collecting an acoustic audio signal generated at a first location within a fixed space comprises collecting an acoustic audio signal generated upon or immediately about a baseball field within a baseball stadium.
6. The method of claim 1 wherein the step of collecting an acoustic audio

signal comprises using a parabolic microphone to collect an acoustic audio signal generated at a first location within a fixed space.

7. The method of claim 1 wherein the step of collecting an acoustic audio signal comprises collecting acoustic audio signals generated at a more than one location within a fixed space.

8. The method of claim 7 wherein the conditioning step comprises mixing said audio signals at desired signal strengths, without introducing audio signals generated from outside the more than one location.

9. The method of claim 1 comprising an additional step wherein the earpiece is disposed of after a single use.

10. The method of claim 1 wherein the step of transmitting said conditioned audio signal comprises transmitting said conditioned audio signal, without introducing noticeable delay, to an earpiece worn by at least one of said plurality of individuals within said fixed space.

11. A method of delivering sound to a plurality of individuals, the method comprising the steps of:
collecting an audio signal generated at a first location within a fixed space;
transmitting, under a first transmission protocol uniquely associated with a particular event and first location within said fixed space, said audio signal collected from said first location to an earpiece worn by at least one of said plurality of individuals within said fixed space; and
receiving said audio signal with said earpiece, wherein said earpiece is configured to operate under said first transmission protocol.

12. The method of claim 11 wherein the transmission protocol comprises a transmission frequency uniquely associated with the particular event.

13. The method of claim 11 wherein the transmission protocol comprises a spreading code uniquely associated with the particular event.

14. The method of claim 11 wherein the transmission protocol comprises an encryption procedure uniquely associated with the particular event.

15. The method of claim 11, wherein:

the method further comprises the steps of:

collecting an audio signal generated at a second location within a fixed space;

transmitting, under a second transmission protocol uniquely associated with a particular event and said second location within said fixed space, said audio signal collected from said second location to an earpiece worn by at least one of said plurality of individuals within said fixed space and at a distance from said first location;

and,

wherein the step of receiving said audio signal with said earpiece comprises receiving said audio signal with said earpiece, wherein said earpiece is configured to selectably operate under said first transmission protocol or said second transmission protocol, thereby permitting an operator of said ear piece to select one of said first or second location within said fixed space that operator would like to listen to.

16. A method of conducting business by deriving revenue from distributing sound to a plurality of individuals, the method comprising the steps of:

collecting an audio signal generated at a first location within a fixed space at a particular event;

transmitting, under a particular transmission protocol uniquely associated with said particular event, said audio signal to an earpiece worn by at least one of said plurality of individuals within said fixed space; and

charging a fee to at least one of said individuals in exchange for said earpiece.

17. The method of claim 16, further comprises the steps of:
collecting an audio signal generated at a second location within a fixed space; and
transmitting, under a second transmission protocol uniquely associated with a
particular event and said second location within said fixed space, said audio signal
collected from said second location to an earpiece worn by at least one of said plurality of
individuals within said fixed space;

18. A method of deriving revenue from the distribution of sound to a plurality
of individuals, the method comprising the steps of:

collecting an audio signal generated at a first location within a fixed space;
transmitting, under a particular transmission protocol uniquely associated with a
particular event, said audio signal to an earpiece worn by at least one of said plurality of
individuals within said fixed space; and

deriving revenue from distribution of said earpiece.

19. The method of claim 17 wherein deriving revenue from distribution of
said earpiece comprises the exchange of money for said earpiece.

20. The method of claim 17 wherein deriving revenue from distribution of
said earpiece comprises selling advertising time scheduled during intervals of
transmission.

21. A system for delivering sound to a plurality of individuals, comprising:
one or more audio collection units for collecting one or more audio signals from
one or more locations within a fixed space;

one or more signal conditioning units coupled to said one or more audio
collection units for conditioning said one or more audio signals without introducing an
audio signal generated from outside said one or more locations; and

one or more transmitters configured and arranged to transmit said one or more
audio signals under one or more transmission protocols, such that each of said one or

more audio signals is transmitted under its own transmission protocol, the transmission protocol under which each of said one or more audio signals is transmitted being uniquely associated with a particular event.

22. The system of claim 21, wherein said one or more audio collection units comprise one or more microphones.

23. The system of claim 22, wherein said one or more audio collection units comprise one or more parabolic microphones.

24. The system of claim 21 wherein the one or more transmitters are configured and arranged to employ a particular spreading code, such that a spreading code that is used for transmission of an audio signal collected from one of the one or more locations during a particular event is not re-used for transmission of another audio signal collected from another of the one or more locations.

25. The system of claim 21 wherein the one or more transmitters are configured and arranged to employ a particular encryption procedure, such that an encryption procedure that is used for transmission of an audio signal collected from one of the one or more locations during a particular event is not re-used for transmission of another audio signal collected from another of the one or more locations.

26. The system of claim 21 wherein the one or more transmitters are configured and arranged to carry the audio signal on a carrier signal at a particular frequency, such that a carrier signal of a particular frequency that is used for carrying an audio signal collected from one of the one or more locations during a particular event is not re-used for carrying another audio signal collected from another of the one or more locations.

PERSONAL LISTENING DEVICE FOR ARENA EVENTS

Abstract of the Disclosure

5 Herein is disclosed a method and apparatus for transmitting sound generated at an event to those in attendance at the event. This is accomplished by a system that collects an acoustic audio signal generated at a first location within a fixed space. The system also conditions the audio signal without introducing audio signals generated from outside said first location. Finally, the system transmits the conditioned audio signal to a receiver
10 worn by at least one of a plurality of individuals within the aforementioned fixed space. This invention is particularly useful in settings such as a football stadium, a basketball arena, a hockey arena, a baseball stadium, an auditorium, a performance area in a restaurant or cruise ship, a soccer arena, a boxing ring or wrestling ring, an automotive racing track, or any other space within which a performance takes place.

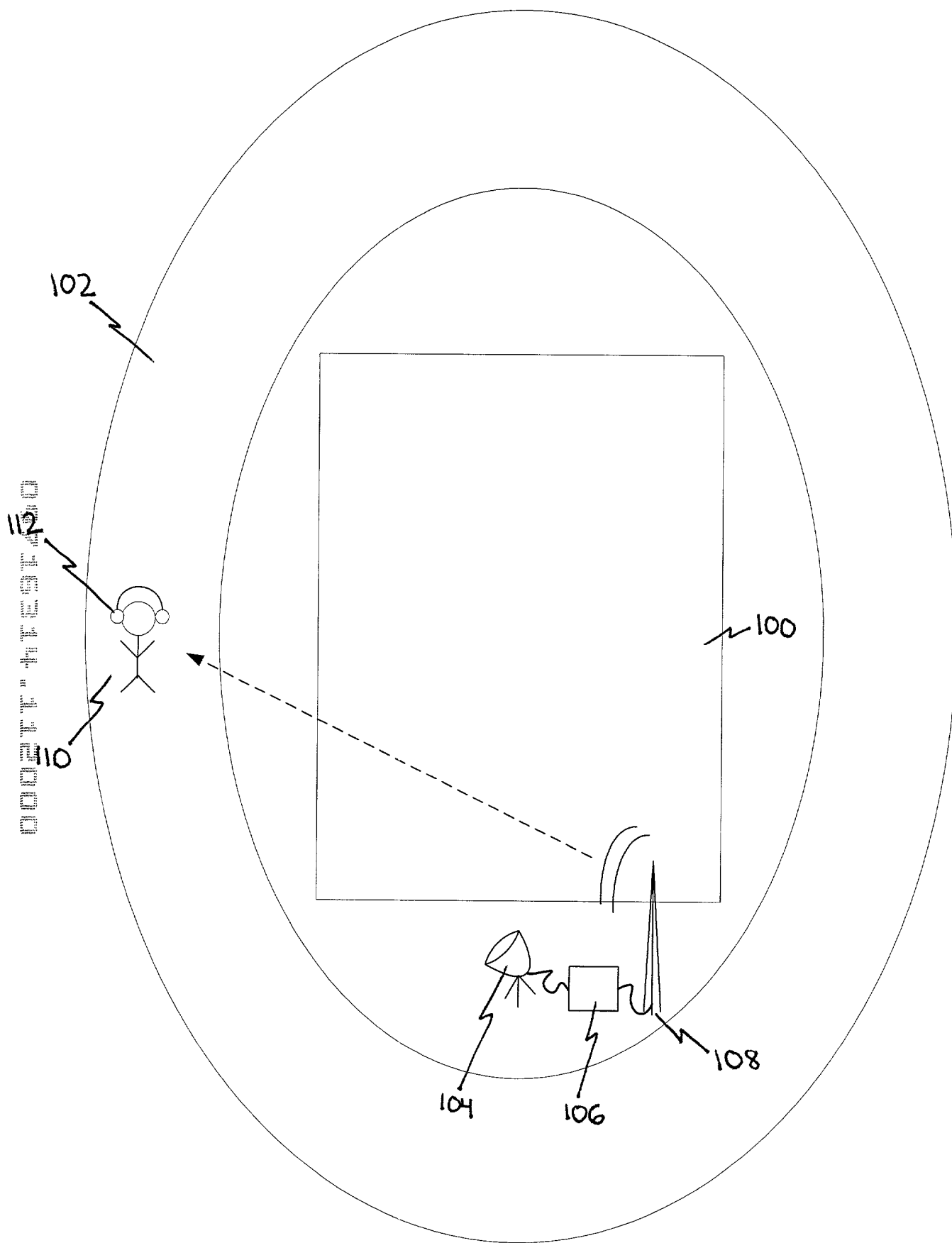


FIG. 1

The diagram illustrates a system architecture. A central rectangular area is divided into two sections: a top section labeled 206 and a bottom section labeled 204. A dashed arrow points from the bottom section 204 to a stick figure on the left, which represents a user wearing a headset. Above the top section 206, there is a component labeled 202 connected to the section by a wavy line. Below the bottom section 204, there are three components: a component labeled 200 connected to the section by a wavy line, a component labeled 106 connected to the section by a wavy line, and a component labeled 108 connected to the section by a wavy line. The entire system is enclosed within a large oval boundary.

FIG. 2

1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2216-2217		2217-2218		2218-2219		2219-2220		2220-2221		2221-2222		2222-2223		2223-2224	
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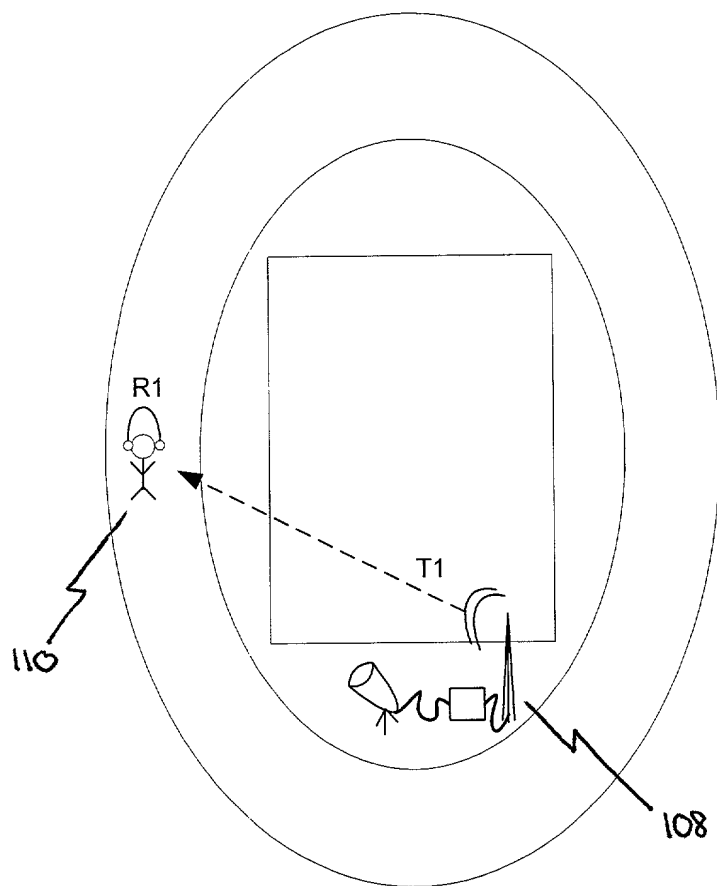


FIG. 3A

Event #2

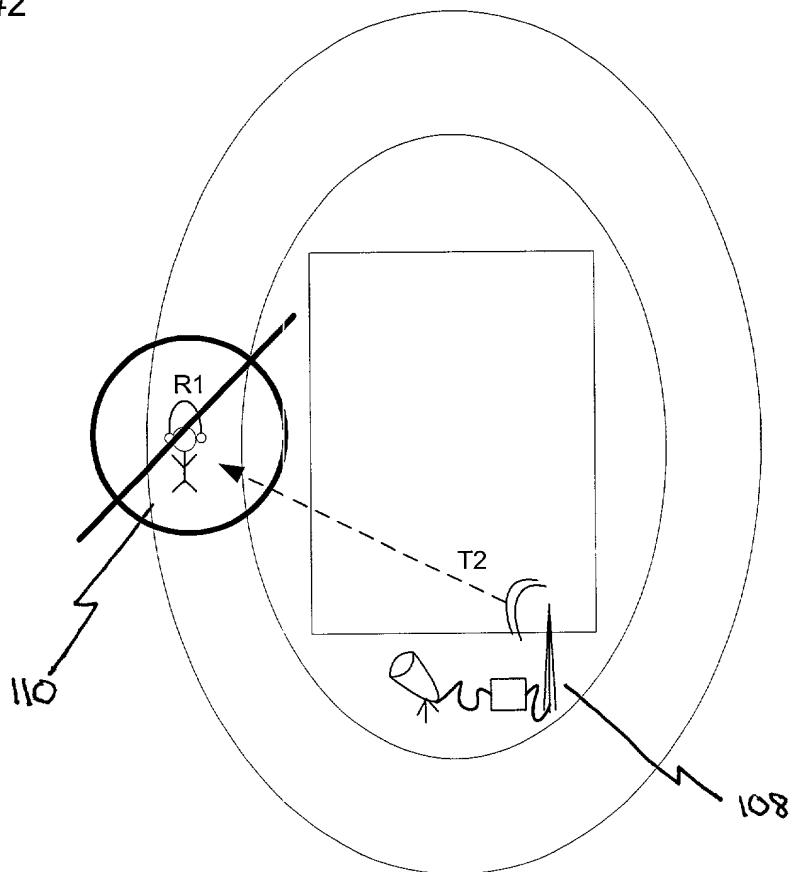
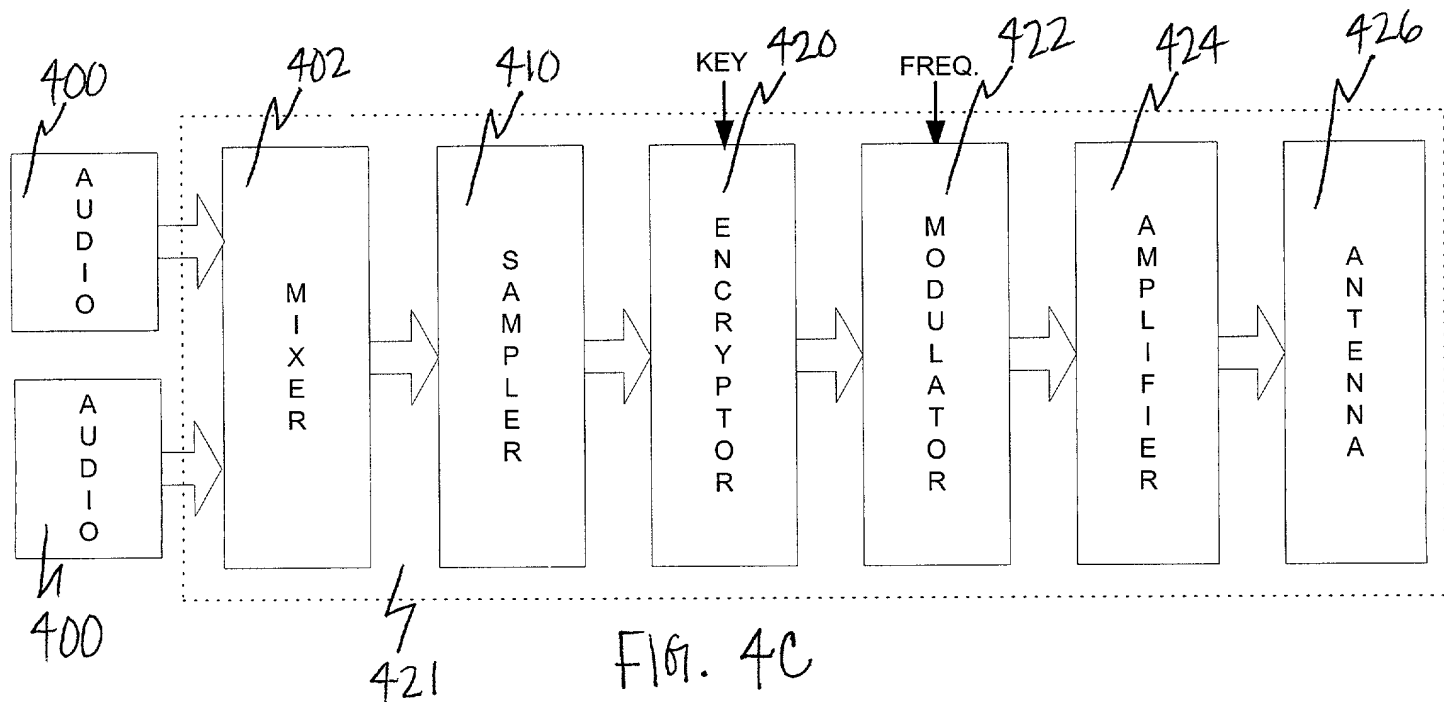
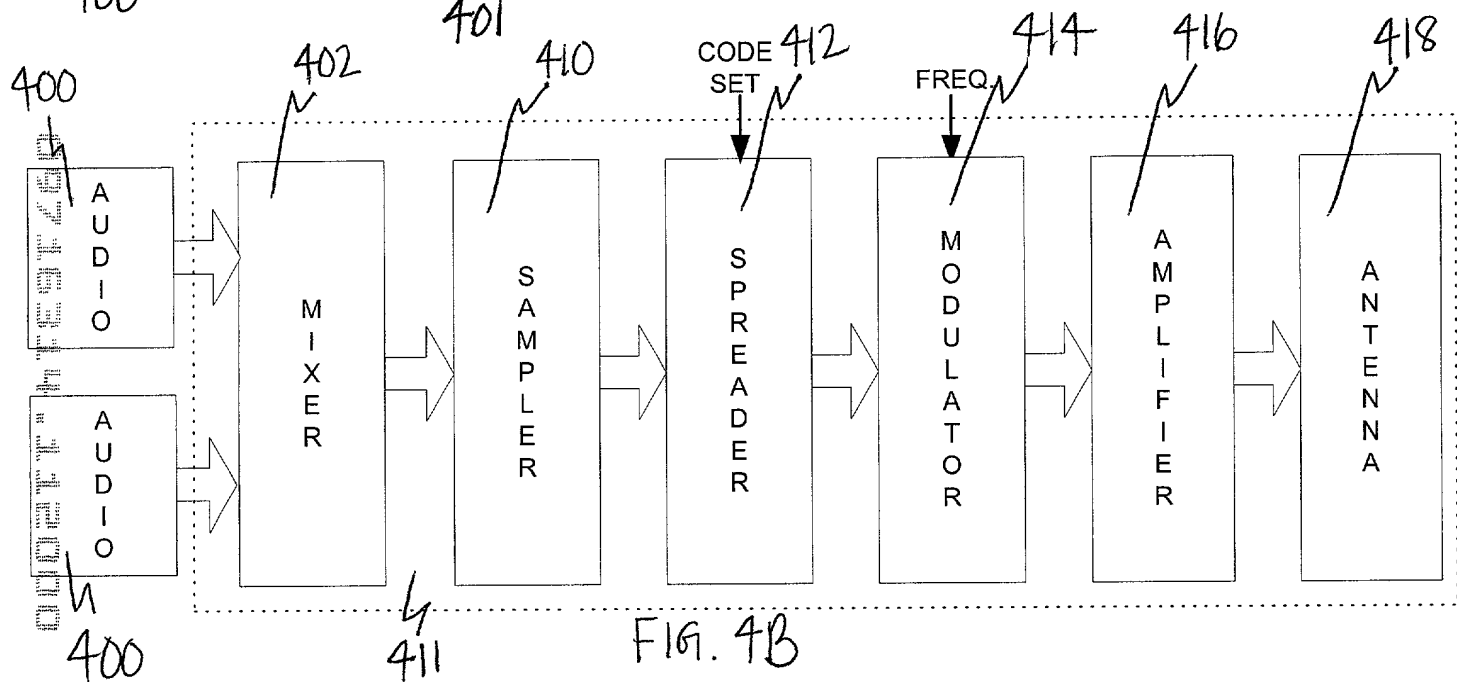
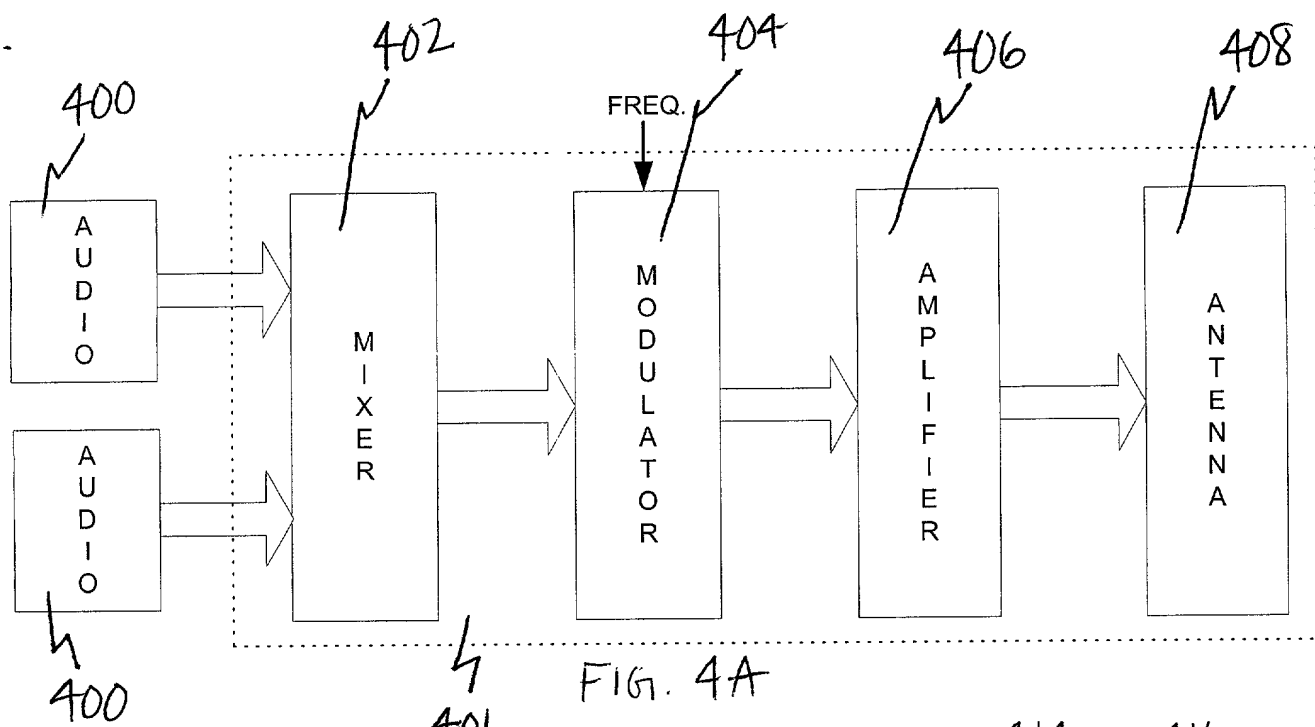


FIG. 3B



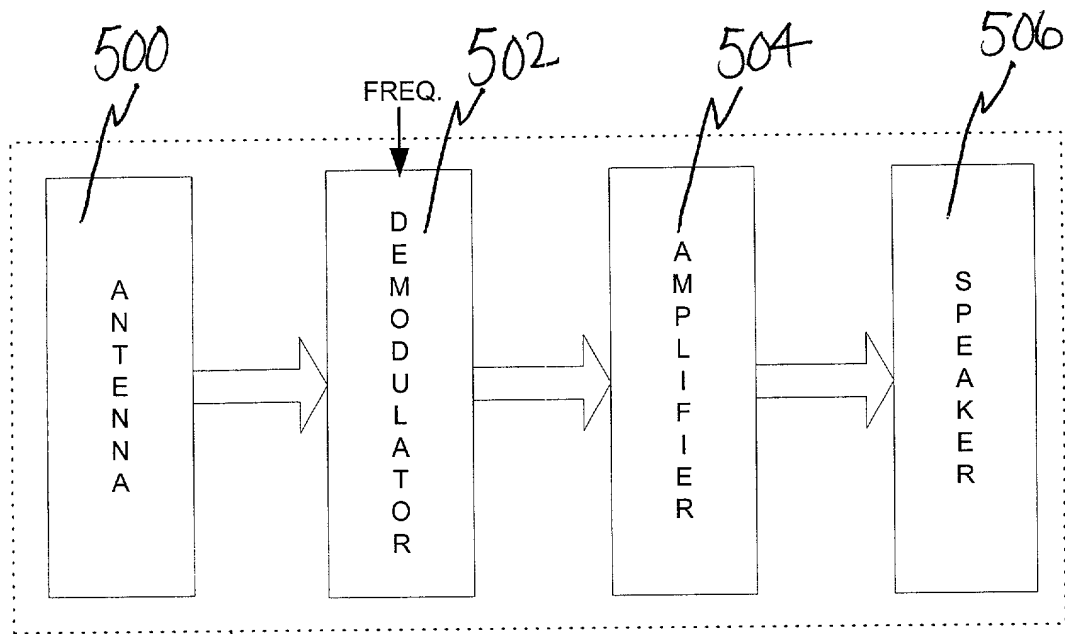


FIG. 5A

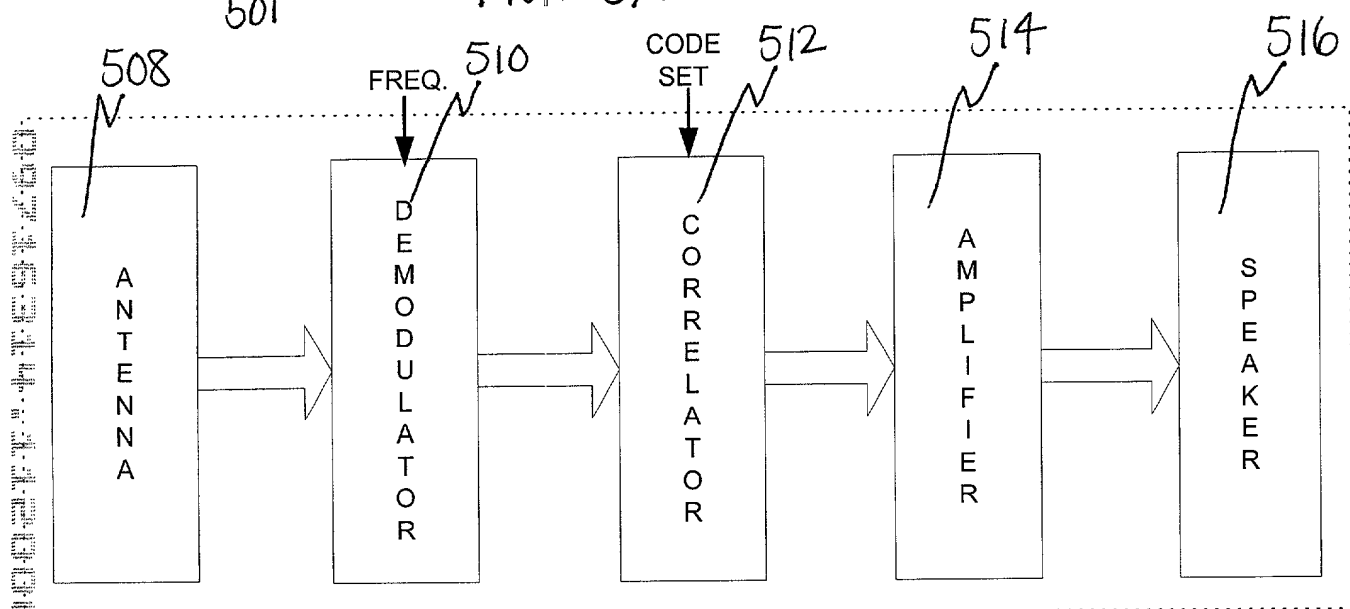


FIG. 5B

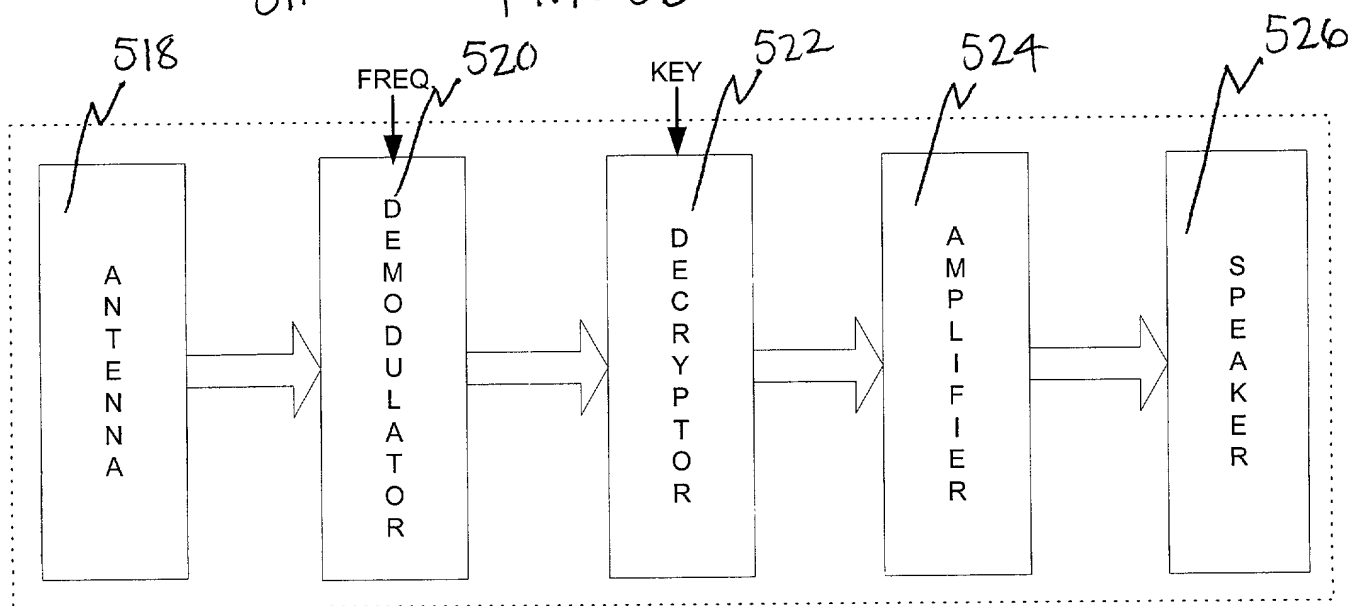


FIG. 5C

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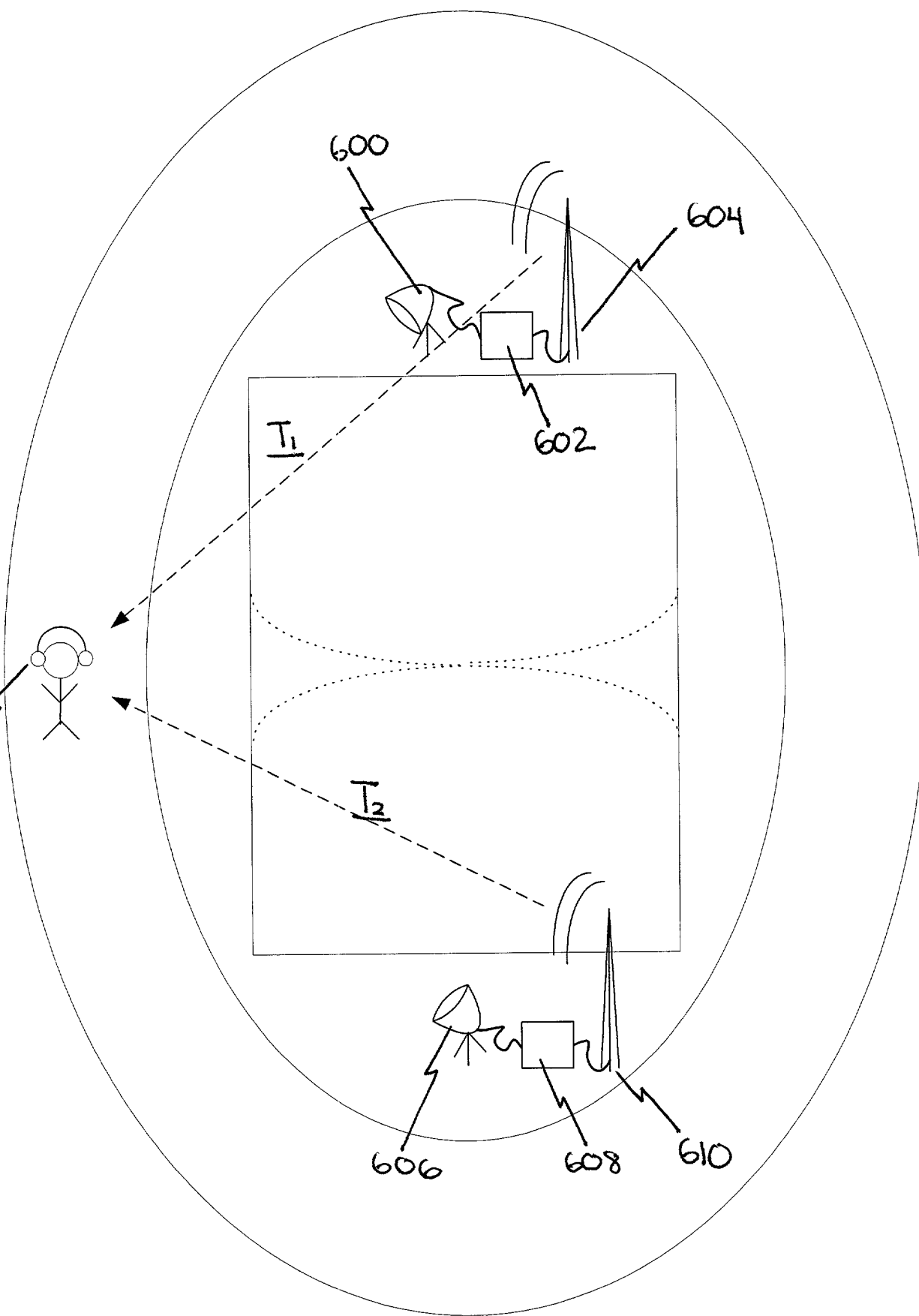


FIG. 6

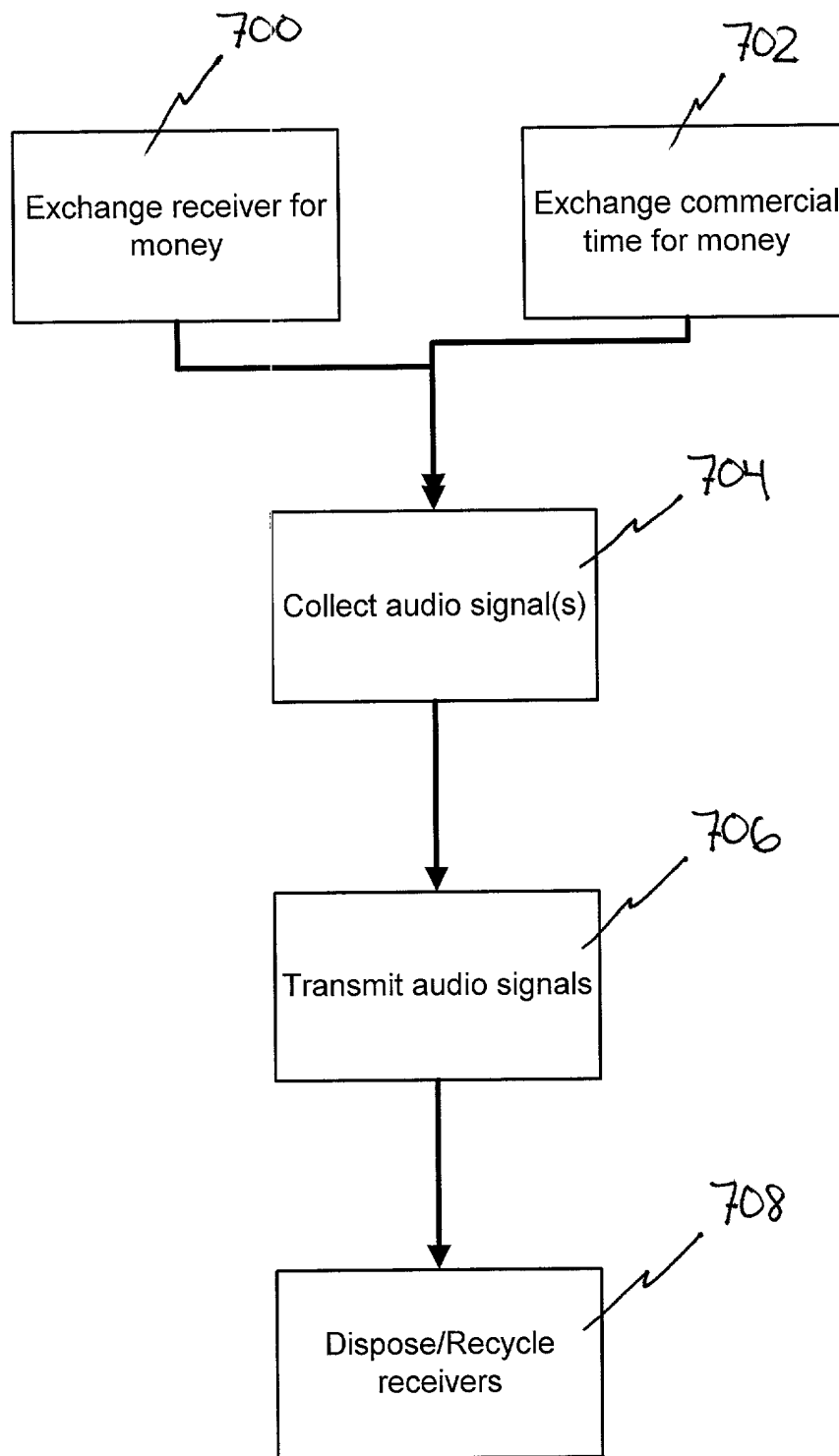
[illegible]

FIG. 7

MERCHANT & GOULD P.C.

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: PERSONAL LISTENING DEVICE FOR ARENA EVENTS

The specification of which

- a. ☒ is attached hereto
b. ☐ was filed on _____ as application serial no. _____ and was amended on _____ (if applicable) (in the case of a PCT-filed application) described and claimed in international no. _____ filed _____ and as amended on _____ (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (attached hereto).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

- a. ☒ no such applications have been filed.
b. ☐ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481	Leon, Andrew J.	Reg. No. 46,869
Ali, M. Jeffer	Reg. No. 46,359	Leonard, Christopher J.	Reg. No. 41,940
Anderson, Gregg I.	Reg. No. 28,828	Liepa, Mara E.	Reg. No. 40,066
Batzli, Brian H.	Reg. No. 32,960	Lindquist, Timothy A.	Reg. No. 40,701
Beard, John L.	Reg. No. 27,612	Lycke, Lawrence E.	Reg. No. 38,540
Berns, John M.	Reg. No. 43,496	Mayfield, Denise L.	Reg. No. 33,732
Black, Bruce E.	Reg. No. 41,622	McDonald, Daniel W.	Reg. No. 32,044
Branch, John W.	Reg. No. 41,633	McIntyre, Jr., William F.	Reg. No. 44,921
Bremer, Dennis C.	Reg. No. 40,528	Mitchem, M. Todd	Reg. No. 40,731
Bruess, Steven C.	Reg. No. 34,130	Mueller, Douglas P.	Reg. No. 30,300
Byrne, Linda M.	Reg. No. 32,404	Nichols, A. Shane	Reg. No. 43,836
Campbell, Keith	Reg. No. P-46,597	Pauly, Daniel M.	Reg. No. 40,123
Carlson, Alan G.	Reg. No. 25,959	Phillips, Bryan K.	Reg. No. P-46,990
Caspers, Philip P.	Reg. No. 33,227	Phillips, John B.	Reg. No. 37,206
Chiapetta, James R.	Reg. No. 39,634	Prendergast, Paul	Reg. No. 46,068
Clifford, John A.	Reg. No. 30,247	Pytel, Melissa J.	Reg. No. 41,512
Coldren, Richard J.	Reg. No. 44,084	Qualey, Terry	Reg. No. 25,148
Daignault, Ronald A.	Reg. No. 25,968	Reich, John C.	Reg. No. 37,703
Daley, Dennis R.	Reg. No. 34,994	Reiland, Earl D.	Reg. No. 25,767
Dalglish, Leslie E.	Reg. No. 40,579	Samuels, Lisa A.	Reg. No. 43,080
Daulton, Julie R.	Reg. No. 36,414	Schmaltz, David G.	Reg. No. 39,828
DeVries Smith, Katherine M.	Reg. No. 42,157	Schuman, Mark D.	Reg. No. 31,197
DiPietro, Mark J.	Reg. No. 28,707	Schumann, Michael D.	Reg. No. 30,422
Edell, Robert T.	Reg. No. 20,187	Scull, Timothy B.	Reg. No. 42,137
Epp, Ryan, Sandra	Reg. No. 39,667	Sebald, Gregory A.	Reg. No. 33,280
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Goggin, Matthew J.	Reg. No. 44,125	Spellman, Steven J.	Reg. No. 45,124
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Gorman, Alan G.	Reg. No. 38,472	Sumner, John P.	Reg. No. 29,114
Gould, John D.	Reg. No. 18,223	Swenson, Erik G.	Reg. No. 45,147
Gregson, Richard	Reg. No. 41,804	Tellekson, David K.	Reg. No. 32,314
Gresens, John J.	Reg. No. 33,112	Trembath, Jon R.	Reg. No. 38,344
Hammer, Samuel A.	Reg. No. 46,754	Tuchman, Ido	Reg. No. 45,924
Hamre, Curtis B.	Reg. No. 29,165	Tunheim, Marcia A.	Reg. No. 42,189
Harrison, Kevin C.	Reg. No. P-46,759	Underhill, Albert L.	Reg. No. 27,403
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Hillson, Randall A.	Reg. No. 31,838	Wahl, John R.	Reg. No. 33,044
Holzer, Jr., Richard J.	Reg. No. 42,668	Weaver, Karrie G.	Reg. No. 43,245
Johnston, Scott W.	Reg. No. 39,721	Welter, Paul A.	Reg. No. 20,890
Kadjevitch, Natalie D.	Reg. No. 34,196	Whipps, Brian	Reg. No. 43,261
Karjeker, Shaukat	Reg. No. 34,049	Whitaker, John E.	Reg. No. 42,222
Kastelic, Joseph M.	Reg. No. 37,160	Wickhem, J. Scot	Reg. No. 41,376
Kettelberger, Denise	Reg. No. 33,924	Williams, Douglas J.	Reg. No. 27,054
Keys, Jeramie J.	Reg. No. 42,724	Withers, James D.	Reg. No. 40,376
Knearl, Homer L.	Reg. No. 21,197	Witt, Jonelle	Reg. No. 41,980
Kowalchyk, Alan W.	Reg. No. 31,535	Wu, Tong	Reg. No. 43,361
Kowalchyk, Katherine M.	Reg. No. 36,848	Xu, Min S.	Reg. No. 39,536
Lacy, Paul E.	Reg. No. 38,946	Zeuli, Anthony R.	Reg. No. 45,255
Larson, James A.	Reg. No. 40,443		

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould P.C. to the contrary.

Please direct all correspondence in this case to Merchant & Gould P.C. at the address indicated below:

Merchant & Gould P.C.
P.O. Box 2903
Minneapolis, MN 55402-0903



I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	Full Name Of Inventor	Family Name SALITERMAN	First Given Name MARK	Second Given Name
0	Residence & Citizenship	City EDINA	State or Foreign Country MINNESOTA	Country of Citizenship USA
1	Post Office Address	Post Office Address 5225 DANCRAIG ROAD	City EDINA	State & Zip Code/Country MINNESOTA 55436/USA
Signature of Inventor 201:				Date:

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim;

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.